



2272704080B.ST25.txt
SEQUENCE LISTING

<110> Bisaro, David M.

<120> Mutant Forms of the AL2 Gene of Geminiviruses

<130> 22727/04080

<140> 09/719,024

<141> 2000-12-05

<150> PCT/US99/12680

<151> 1999-06-04

<160> 147

<170> PatentIn version 3.1

<210> 1

<211> 129

<212> PRT

<213> Tomato golden mosaic virus

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Arg Ala Ala Lys Arg Arg Ala Ile Arg Arg Arg Arg Ile Asp Leu Asn
20 25 30

Cys Gly Cys Ser Ile Tyr Ile His Ile Asp Cys Arg Asn Asn Gly Phe
35 40 45

Thr His Arg Gly Thr Tyr His Cys Ala Ser Ser Arg Glu Trp Arg Leu
50 55 60

Tyr Leu Gly Ile Asn Lys Ser Pro Leu Phe Gln Asp Asn Gln Arg Arg
65 70 75 80

Gly Ser Pro Leu His Gln His Gln Asp Ile Pro Leu Thr Asn Gln Val
85 90 95

Gln Pro Gln Pro Glu Glu Ser Ile Gly Ser Pro Gln Gly Ile Ser Gln
100 105 110

Leu Pro Ser Met Asp Asp Ile Asp Asp Ser Phe Trp Glu Asn Leu Phe
115 120 125

Lys

<210> 2

<211> 129

<212> PRT

<213> Abutilon mosaic virus

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 20 25 30

Cys Gly Cys Ser Ile Tyr Phe His Ile Asp Cys Thr Gly His Gly Phe
 35 40 45

Thr His Arg Gly Thr His His Cys Thr Ser Gly Gly Glu Trp Arg Val
 50 55 60

Tyr Leu Gly Asp Lys Lys Ser Pro Val Phe Gln Asp Val Gln Ser Arg
 65 70 75 80

Arg Thr Ile Ile His Gln Asn Glu Asn Ile Pro Cys Thr Asn Thr Val
 85 90 95

Gln Pro Gln Pro Glu Glu Ser Val Ala Ser Pro Gln Ser Leu Pro Glu
 100 105 110

Leu Pro Ser Leu Asp Asp Ile Asp Glu Ser Phe Trp Val Asn Leu Phe
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Ser

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<211> 129

<212> PRT

<213> Abutilon mosaic virus

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 20 25 30

Cys Gly Cys Ser Ile Tyr Phe His Ile Asp Cys Thr Gly His Gly Phe
 35 40 45

Thr His Arg Gly Ile His His Cys Thr Ser Gly Gly Glu Trp Arg Val
 50 55 60

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Tyr Leu Gly Asp Ser Lys Ser Pro Val Phe Gln Asp Ile Gln Ser Arg
65 70 75 80

Gly Pro Ala Ile His Gln Asn Glu Asp Ile Pro Cys Thr Asn Thr Val
85 90 95

Gln Pro Gln Pro Glu Glu Ser Val Ala Ser Pro Gln Ser Leu Pro Glu
100 105 110

Leu Pro Ser Leu Asp Asp Phe Asp Asp Ser Phe Trp Val Asn Leu Phe
115 120 125

Lys

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<212> PRT
<213> Bean dwarf mosaic virus

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20 25 30

Cys Gly Cys Ser Ile Tyr Thr His Ile Gly Cys Thr Gly His Gly Phe
35 40 45

Thr His Arg Gly Ala His His Cys Thr Ser Ser Arg Glu Trp Arg Val
50 55 60

Tyr Leu Gly Asp Arg Lys Ser Pro Leu Phe Gln Asp Ile Gln Ser Arg
65 70 75 80

Gly Thr Val Val His Gln Gln Gln Gly Ile Gln Arg Thr Asp Thr Val
85 90 95

Gln Pro Gln Pro Glu Glu Ser Val Ala Ser Pro Gln Ser Leu Pro Glu
100 105 110

Leu Pro Ser Leu Asp Asp Ile Asp Asp Ser Phe Trp Val Asp Leu Phe
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Lys

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Arg Ile Ala Lys Arg Lys Ala Ile Arg Arg Arg Arg Ile Asp Leu Asn
 20 25 30

Cys Gly Cys Ser Ile Phe Tyr His Ile Lys Cys Ala Asp His Gly Phe
 35 40 45

Thr His Arg Gly Glu His His Cys Ala Ser Gly Arg Glu Phe Arg Phe
 50 55 60

Tyr Leu Gly Gly Thr Lys Ser Pro Leu Phe Gln Asp His Ala Gly Gly
 65 70 75 80

Arg Ser Ser Ile His Thr Asp Lys Asp Ile Pro His Pro Ser Gln Val
 85 90 95

Gln Ser Gln Pro Gln Glu Ser Thr Gly Ser Pro Gln Ser Ile Pro Glu
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Leu Pro Ser Leu Asp Asp Ile Asp Ser Ser Phe Trp Asp Asp Ile Phe
 115 120 125

Lys

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Arg Ile Ala Lys Arg Arg Ala Ile Arg Arg Arg Arg Ile Asp Leu Asn
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Cys Gly Cys Ser Ile Phe Tyr His Ile Lys Cys Ala Asp His Gly Phe
 35 40 45

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Thr His Arg Gly Glu His His Cys Ala Ser Gly Arg Glu Phe Arg Phe
50 55 60

Tyr Leu Gly Gly Thr Lys Ser Pro Leu Phe Gln Asp Asn Ala Gly Gly
65 70 75 80

Arg Ser Ser Ile His Thr Asp Lys Asp Ile Pro His Pro Asn Gln Val
85 90 95

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100 105 110

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115 120 125

Lys

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Arg Ile Ala Lys His Lys Ala Ile Arg Arg Arg Arg Ile Asp Leu Asn
20 25 30

Cys Gly Cys Ser Ile Phe Tyr His Ile Lys Cys Ala Asp His Gly Phe
35 40 45

Thr His Arg Gly Glu His His Cys Ala Ser Gly Arg Glu Phe Arg Phe
50 55 60

Tyr Leu Gly Gly Thr Lys Ser Pro Leu Phe Gln Asp His Ala Gly Gly
65 70 75 80

Arg Ser Ser Ile His Thr Asp Lys Asp Ile Pro His Pro Ser Gln Val
85 90 95

Gln Ser Gln Pro Gln Glu Ser Thr Gly Ser Pro Gln Ser Ile Pro Glu
100 105 110

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115 120 125

Lys

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Met Gln Asn Ser Ser Leu Leu Lys Pro Pro Ser Ile Lys Ala Gln His
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Lys Ile Ala Lys Arg Arg Ala Val Arg Arg Arg Arg Ile Asp Leu Asn
 20 25 30

Cys Gly Cys Ser Ile Phe Leu His Ile Asn Cys Ala Asp Asn Gly Phe
 35 40 45

Thr His Arg Gly Glu His His Cys Ser Ser Gly Arg Glu Phe Arg Phe
 50 55 60

Tyr Leu Gly Gly Ser Lys Ser Pro Ile Phe Gln Asp Thr Thr Arg Arg
 65 70 75 80

Gly Pro Val Val His Gln Asn Gln Asp Leu Pro His Pro Ser Pro Val
 85 90 95

Gln Pro Gln Pro Thr Glu Ser Ile Gly Ser Pro Gln Ser Leu Leu Gln
 100 105 110

Leu Pro Ser Leu Asp Asp Phe Asp Glu Ser Phe Trp Ala Asp Ile Phe
 115 120 125

Lys

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 <213> Potato yellow mosaic virus

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Arg Gln Ala Lys Lys Arg Ala Ile Arg Arg Arg Arg Ile Asp Leu Asp
 20 25 30

Cys Gly Cys Ser Ile Tyr Phe His Ile Asp Cys Ala Gly His Gly Phe
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35

40

45

Thr His Arg Gly Ala His His Cys Thr Ser Gly Arg Glu Trp Arg Val
 50 55 60

Tyr Leu Gly Asp Arg Lys Ser Pro Leu Phe Gln Asp Lys Pro Ser Arg
 65 70 75 80

Gly His Ala Ile His Gln Asp Gln Asp Ile Gln Arg Pro Asn Pro Val
 85 90 95

Gln Pro Gln Pro Gln Glu Ser Ile Gly Ser Pro Gln Ser Ile Pro Glu
 100 105 110

Leu Pro Ser Leu Asp Asp Ile Asp Asp Ser Phe Trp Val Glu Leu Phe
 115 120 125

Ser

<210> 10

<211> 129

<212> PRT

<213> Sida golden mosaic geminivirus

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Met Arg Ser Ser Ser Pro Ser Thr Pro Pro Ser Ile Lys Lys Thr His
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Arg Gln Ala Lys Lys Arg Ser Val Arg Arg Arg Arg Ile Asp Leu Glu
 20 25 30

Cys Gly Cys Ser Ile Tyr Phe His Ile Gly Cys Thr Gly His Gly Phe
 35 40 45

Thr His Arg Gly Thr His His Cys Thr Ser Phe Arg Glu Trp Arg Leu
 50 55 60

Tyr Leu Gly Asp Arg Lys Ser Pro Leu Phe Gln Asp Ile Gln Gly Arg
 65 70 75 80

Gly Ser Thr Val His Glu His Gln Asp Ile Gln Tyr Pro Asn Phe Val
 85 90 95

Gln Pro Gln Pro Glu Glu Ser Val Ala Ser Pro Gln Ser Val Pro Glu
 100 105 110

Leu Pro Ser Leu Asp Asp Ile Pro Asp Ser Phe Trp Val Asp Leu Phe
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115 2272704080B.ST25.txt 120 125

Lys

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 <211> 131
 <212> PRT
 <213> Squash leaf curl virus

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Met Pro Asn Ser Ser Ser Ser Lys Val Pro Ser Ile Lys Ala Gln His
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Arg Ile Ala Lys Lys Arg Ala Val Arg Arg Arg Arg Ile Asp Leu Asp
 20 25 30

Cys Gly Cys Ser Ile Tyr Ile His Ile Asn Cys Ala Lys Asp Gly Asn
 35 40 45

Gly Phe Thr His Met Gly Arg His His Cys Ala Ser Gly Arg Glu Phe
 50 55 60

Arg Phe Tyr Leu Gly Gly Ser Lys Ser Pro Leu Phe Gln Asp Val Gln
 65 70 75 80

Arg Gly Gly Ser Thr Leu His Ala His Lys Asp Ile Pro His Thr Asn
 85 90 95

Pro Val Gln Pro Gln Pro Glu Glu Ser Thr Lys Ser Ser Gln Ser Val
 100 105 110

Pro Glu Leu Pro Ser Leu Asp Gly Ile Asp Ser Ser Phe Trp Asp Asp
 115 120 125

Ile Phe Glu
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 20 25 30

Cys Gly Cys Ser Ile Tyr Phe His Leu Gly Cys Ala Gly His Gly Phe
35 40 45
Thr His Arg Gly Thr His His Cys Thr Ser Gly Gly Trp Glu Arg Val
50 55 60
Tyr Leu Gly Ala Arg Lys Ser Pro Leu Phe Gln Asp Thr Gln Ser Arg
65 70 75 80
Gly Pro Thr Val Tyr Gln Asn Glu Gly Ile Pro Arg Thr Asp Thr Val
85 90 95
Gln Pro Gln Pro Glu Glu Ser Val Ala Ser Pro Gln Ser Leu Pro Glu
100 105 110
Leu Pro Ser Leu Asp Asp Val Asp Asp Ser Phe Trp Ile Asn Leu Phe
115 120 125

Ser

<210> 13
<211> 129
<212> PRT
<213> Texas pepper virus
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Arg Ile Ala Lys Lys Arg Pro Ile Arg Arg Arg Arg Ile Asp Leu Asn
20 25 30
Cys Gly Cys Ser Ile Phe Leu His Ile Asn Cys Ala Asn Asn Gly Phe
35 40 45
Thr His Arg Gly Glu His His Cys Ala Ser Gly Arg Glu Phe Arg Phe
50 55 60
Tyr Leu Gly Gly Ala Lys Ser Pro Ile Phe Gln Asp Thr Ala Arg Gly
65 70 75 80
Gly Pro Val Val His Gln Asn Gln Asp Ile Pro His Arg Ser Pro Val
85 90 95
Gln Pro Gln Pro Thr Ser Ser Ile Ser Ser Pro Gln Gly Ile Pro Pro
100 105 110

Phe Pro Ser Leu Asp Asp Phe Asp Asp Ser Phe Trp Asp Asp Ile Phe
 115 120 125

Lys

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Asp Asp Ile Asp Asp Ser Phe Trp Glu Asn Leu Phe Lys
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<210> 20
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 gcgggcgcca tgcgaaattc gtcttcc 27

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<210> 63
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 <210> 69
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<210> 72
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<210> 74
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<210> 77

<211> 2629

<212> DNA

<213> Abutilon mosaic virus - West Indies isolate

<400> 77

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<210> 78
 <211> 2779
 <212> DNA
 <213> African cassava mosaic virus - west Kenyan isolate

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<210> 79

<211> 2781

<212> DNA

<213> African cassava mosaic virus - Nigerian isolate

<400> 79

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<211> 2741

<212> DNA

<213> Ageratum yellow vein virus

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<210> 81

<211> 2755

<212> DNA

<213> Althea rose enation virus - Egypt isolate

<400> 81

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<210> 82

<211> 2746

<212> DNA

<213> Angled luffa leaf curl virus - Thailand isolate (part 1)

<400> 82

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<210> 83
<211> 1225
<212> DNA

<213> Angled luffa leaf curl virus - Thailand isolate (part 2)

<400> 83

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<210> 84

<211> 2615

<212> DNA

<213> Bean dwarf mosaic virus

<400> 84

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<210> 85

<211> 2646

<212> DNA

<213> Bean golden mosaic virus - Puerto Rico isolate

<400> 85

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 <211> 2617
 <212> DNA
 <213> Bean golden mosaic virus - Brazil isolate

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<211> 2647

<212> DNA

<213> Bean golden mosaic virus - Dominican Republic isolate

<400> 87

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<211> 2787

<212> DNA

<213> Chayote mosaic virus - Ibadan (Nigeria) isolate

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<210> 91

<211> 2728

<212> DNA

<213> Cowpea golden mosaic virus - Nsukka (Nigeria) isolate

<400> 91

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2728

<210> 92

<211> 2751

<212> DNA

<213> cotton leaf curl virus - Pakistan isolate (clc62)

<400> 92

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<210> 93

<211> 2748

<212> DNA

<213> cotton leaf curl virus - Pakistan isolate (clc72b)

<400> 93

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<210> 94

<211> 2748

<212> DNA

<213> cotton leaf curl virus - Pakistan isolate (clc806b)

<400> 94

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<210> 95

<211> 2744

<212> DNA

<213> cotton leaf curl virus - Pakistan isolate (clc804a)

<400> 95

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<210> 96

<211> 2744

<212> DNA

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<400> 96

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<210> 97

<211> 2751

<212> DNA

<213> cotton leaf curl virus Pakistan isolate (clc26)

<400> 97

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<210> 98

<211> 2725

<212> DNA

<213> cotton leaf curl virus - Pakistan okra leaf curl isolate (olc311)

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2725

<210> 99

<211> 2620

<212> DNA

<213> Havana tomato virus - Cuba isolate

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 <213> Ipomoea yellow vein virus - Spain isolate

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<210> 103

<211> 2723

<212> DNA

<213> Mungbean yellow mosaic virus - Japan isolate

<400> 103

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<211> 2726

<212> DNA

<213> Mungbean yellow mosaic virus - Thailand isolate

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<210> 105

<211> 2739

<212> DNA

<213> Okra yellow vein virus - Pakistan isolate (oyvm201)

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<210> 106

<211> 2741

<212> DNA

<213> Okra yellow vein virus - Pakistan isolate (oyvm3-1)

<400> 106

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<211> 2746
<212> DNA
<213> papaya yellow mosaic virus

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<210> 109
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 <212> DNA
 <213> Potato yellow mosaic virus

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<400> 109
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2272704080B.ST25.txt

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<211> 2605

<212> DNA

<213> Sida golden mosaic virus - Costa Rica isolate

<400> 110

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<211> 2603
<212> DNA
<213> Sida golden mosaic virus - Honduras isolate
<400> 111

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<210> 112
<211> 2612

<212> DNA

<213> Sida golden mosaic virus - Honduras isolate (yellow vein)

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<210> 113
 <211> 2642
 <212> DNA
 <213> Sida golden mosaic virus - Florida isolate

2272704080B.ST25.txt

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<211> 2634
<212> DNA
<213> Squash leaf curl virus - Extended host range isolate (California)

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 <211> 2741
 <212> DNA
 <213> Squash leaf curl virus - China isolate

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 <212> DNA
 <213> Taino tomato mottle virus - Cuba isolate

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<210> 117

<211> 2613

<212> DNA

<213> Texas pepper virus - Tamuilipas (Mexico) isolate

<400> 117

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<210> 118

<211> 2588

<212> DNA

<213> Tomato golden mosaic virus - Brazil isolate

<400> 118

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 <211> 2634
 <212> DNA
 <213> Tomato leaf crumple virus - Mexico isolate

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<210> 120
 <211> 2601
 <212> DNA
 <213> Tomato mottle virus - Florida isolate

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<210> 121
 <211> 2766
 <212> DNA
 <213> Tomato leaf curl virus - Australia isolate

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<211> 2766

<212> DNA

<213> Tomato leaf curl virus - Australia isolate-D1

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 <212> DNA
 <213> Tomato leaf curl virus - Australia isolate-D2

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<211> 5435

<212> DNA

<213> Tomato leaf curl virus - New Delhi-1 (India) isolate (part 1)

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<211> 2696

<212> DNA

<213> Tomato leaf curl virus - New Delhi-1 (India) isolate (part 2)

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<210> 126

<211> 2739

<212> DNA

<213> Tomato leaf curl virus - New Delhi-2 (India) isolate

<400> 126

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<210> 127
<211> 2749
<212> DNA
<213> Tomato leaf curl virus - India isolate

<400> 127
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<210> 128
 <211> 2749
 <212> DNA
 <213> Tomato leaf curl virus - Bangalor-1 isolate

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<211> 2759

<212> DNA

<213> Tomato leaf curl virus - Banglor-2 isolate

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<212> DNA
<213> Tomato leaf curl virus - Senegal isolate

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<223> n is a, c, t or g

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<210> 131

<211> 2739

<212> DNA

<213> Tomato leaf curl virus - India isolate

<400> 131

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<210> 132
 <211> 2584
 <212> DNA
 <213> Tomato leaf curl virus - Panama isolate

<400> 132	
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tatt						2584

<210> 133

<211> 2787

<212> DNA

<213> tomato yellow leaf curl virus - Israel isolate

<400> 133

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 ggcatatatt ttaaataaac gaggcatt 2787

<210> 134

<211> 2790

<212> DNA

<213> tomato yellow leaf curl virus - Israel-2 isolate

<400> 134

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<210> 135
 <211> 2773
 <212> DNA
 <213> tomato yellow leaf curl virus - Sardinia isolate

<400> 135
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<210> 136

<211> 2773

<212> DNA

<213> tomato yellow leaf curl virus - Sicily isolate

<400> 136

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<210> 137

<211> 2777

<212> DNA

<213> tomato yellow leaf curl virus - Murcia (Spain) isolate

<400> 137

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<210> 138

<211> 2777

<212> DNA

<213> tomato yellow leaf curl virus - Almeria (Spain) isolate

<400> 138

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 <211> 2793
 <212> DNA
 <213> tomato yellow leaf curl virus - Portugal isolate

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2793

<210> 140

<211> 2791

<212> DNA

<213> tomato yellow leaf curl virus - Spain isolate (Sp7297)

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<210> 141
 <211> 2781
 <212> DNA
 <213> tomato yellow leaf curl virus - Spain isolate

<400> 141
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tcattaaagc ggcatccgt a	2781

<210> 142

<211> 2781

<212> DNA

<213> tomato yellow leaf curl virus - Dominican Republic isolate

<400> 142

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<210> 143
 <211> 2771
 <212> DNA
 <213> tomato yellow leaf curl virus - Iran isolate

<400> 143	
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 cgtataatat t 2771

<210> 144

<211> 2791

<212> DNA

<213> tomato yellow leaf curl virus - Shizuoka (Japan) isolate

<400> 144

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<210> 145
 <211> 2787
 <212> DNA
 <213> tomato yellow leaf curl virus - Aichi (Japan) isolate

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<212> DNA

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